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Design Challenge Journal Report
Lab Science 9- Physics
2/9/10

Statement: In this challenge, we were trying to achieve movement through building a car and meeting or surpassing various goals set by the test.

Journal:
January 19, 2009
-Came up with roles for tests (Levin-Fall test, Bumpy Terrain, Steering; Anthony-Speed, and slope; Harry- Tow/Weights/Load; Allyn-Ramp/Water
-Sanded and cut block of wood for frame
-Started finding and testing wheels
-Found two potential "Monster" wheels that will be good for fall tests (biggest that we've seen so far)

January 21, 2009
-Found more potential wheels
-Cut up copper rods as axels
-Started hot-gluing wheels to axels to keep them steady
-Began to add gears to axels (and learned how to: hammer them on)
-Found Styrofoam block ideal for speed car

How the Chapter 4 ideas and principles apply to my design challenge:
Section 4.3:
Figure 4.6-Action: tire pushes on road Reaction: road pushes on car
This applies to our design challenge because we are trying to get our car to move at least a meter and this explains how and why it will work.

January 25,2010
-Got engine working
-Figured out how to use the switch (without teacher)
-Came up with base model of speed car
-Carved a little "trench" to place the gears/engine in
-Attached engine to car

Homework:
1. a because of Newton's third law
2. b because of Newton's third law
3. c
4. b because you have greater inertia
5. a
6. c
7. a
8. a
9. c
10. c

January 27, 2010
-Finished one car
-Tested car on several tests (passed all)
- Began work on other cars
-Saudered wires onto the car
-Got car to work
-Car was extremely fast, finishing several tests on the first try
-Now dubbed "awesome" car

Homework.
1. A
2. A
3. B
4. B
5. D
6. A
7.C
8. D
9. B
10. C

January 29, 2009
-Tested the "awesome" car on the slope (was complete failure)
-Realized problem of car (straw was scraping against the axel producing a ton of friction, therefore greatly limiting speed)
-Semi-fixed problem through dismantling and re-sauntering the car completely, however after one test the problem arose again
-Redesigned "endurance" car; meaning the car designed to survive the bumpy test, fall test, and steering test
-Began work on "endurance" car, attaching engine to wheels, and hot gluing the wheels to the copper rod; also added gears to axel by viciously hammering the rod into the gear.
- Tested frame by dropping the frame from higher heights than tests and seeing if it holds

February 2, 2010
Conceptual Understanding-

Chapter 2: Words to Know and Use: Page 34
"Think and Explain"
2. The racecar cannot go at a constant velocity around a curve because the car is changing direction.
4. It would be an advantage because the bear's inertia would make it have to slow down or risk losing control and crashing into something.
8. This does violate Newton's law of inertia because when you stop pushing the car, it is not supposed to suddenly come to a rest. First, it decelerates and then stops because of the force of friction acting on it.
14. 450 Newtons

“Think and Solve”
1. 5m/s
4a. 0N
4b.100N

Chapter 3: Words to Know and Use: Page 53
“Think and Explain”
2. According to Newton’s Second Law, it hurts more because the hand has more mass than before.
4. At rest: 0N
When released: 1N
7. Weight does not affect acceleration because gravity pulls on everything at the same rate (9.8 m/s).
(Continued on actual document)

February 2, 2010
-Took the Quiz
-Continued work on car a small bit

February 8, 2010
-Went over quiz answers
-looked at four questions in particular
-Continued work on cars, finished fall test {however car broke on second try :(}
-Almost finished with the “Strength” car (meant for towing loads and carrying loads… also might pass as bumpy terrain)

Design: For our first car, we decided to build it out of Styrofoam, so as to reduce the weight of the car and increase the total net force being pushed forward. (See Figure 1) With less mass, there is less inertia, therefore making it easier to move and accelerate quickly. For the most part, this design worked perfectly. However, after a few tests a problem was encountered that noticeably slowed the car down. Apparently one of the straws used to reduce the amount of friction between the Styrofoam and the wheels (Figure 3) had been shredded against the gears between the axel and engine. This produced so much friction, that the car’s velocity was much lesser than before, even though it sounded like the engine was working at a much higher speed. After several attempts to fix this problem, the car was abandoned and we moved on to creating the next car.

The next car that we made was designed with endurance in mind. We had stumbled upon some abnormally large wheels (at least for a toy) that could be considered “Monster” wheels and decided to use this to our advantage. If the car somehow flips, then maybe make it so that the engine and body could remain above ground, while the wheels take the brunt force of the fall. Soon, we decided to entirely scrap the body as it provided too much possibility for error so that part was scrapped and we were just left with the two large wheels, an axel, a nine-volt battery, and a small engine. (Seen in Figure 4) This design was actually successful in that it survived the first fall, however the second fall blew off one of the wheels and sent the entire “car” spinning in place because of Newton’s Third

Law. Since there was only a force pushing on one side, the car spun in a circle. Miraculously, the only part that fell off was the wheel and the engine and battery remained stationary.

The car that we are currently working on, the "Strength" car, is basically a flat body with a powerful engine powered by a large battery (9-volt) on wheels that generate lots of friction. (see figure 2) We are planning to add some weight in the front so as to make sure that the car is able to pull forward with more inertia than the load can pull back with (Newton's Third Law). Hopefully this car will be very sturdy and strong and able to pull along as well as support the two textbooks needed to pass.

Pictures:

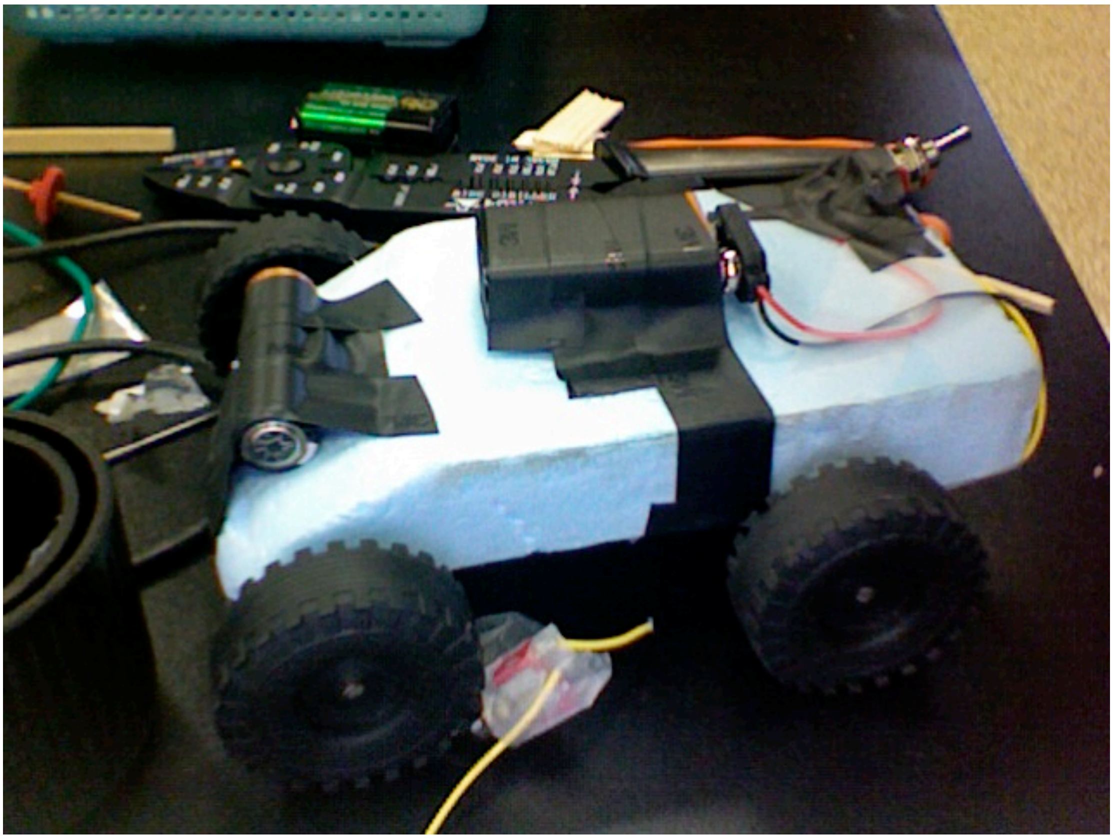


Figure 1- The original car that was thought to be able to pass all tests. Due to its light weight, compact size,, and even weight distribution, it moved at a high speed and had very high acceleration

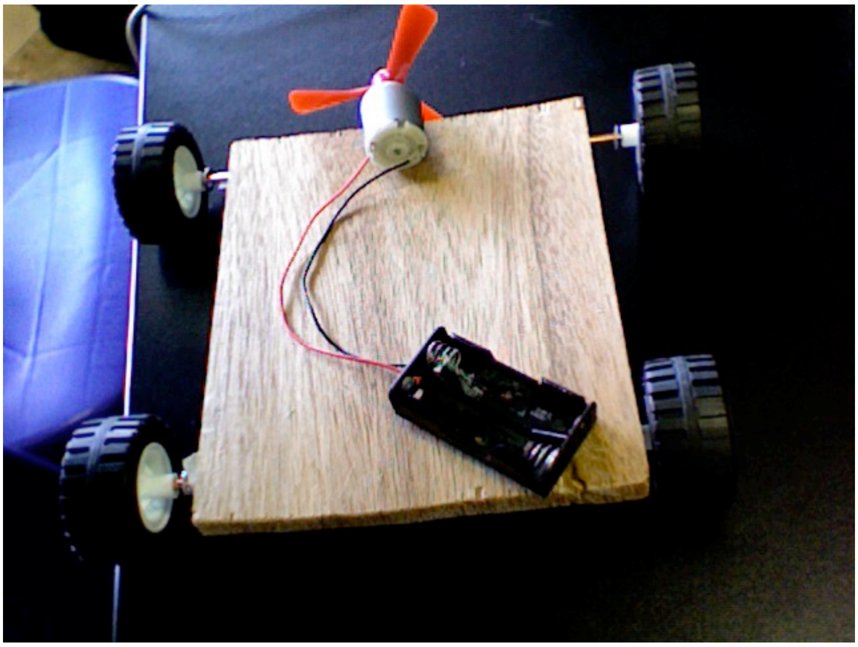
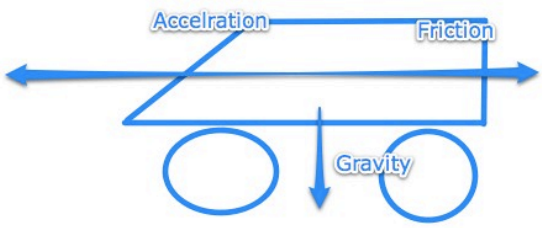


Figure 2- The strength car in progress. The wide body is meant to disperse the strain on the car, while the just happened to be in the picture. The rods were purposely placed close to the ground so that the tires could use the ground as a greater source of friction and energy.

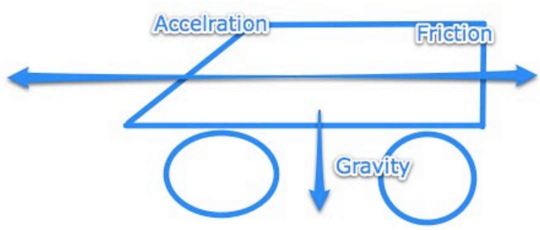
Figure 3- A picture of the engine layout of the first car, shows how the straws prevent the tires from rubbing against the body, while the trenches were dugout so the engine and gears could be place on the underside so as to avoid the potential danger of external wires.

Free Body Diagrams:

Constant Velocity



Constant Velocity



Acceleration